

## WHAT IS CLAIMED IS:

## 1. A semiconductor package comprising:

a first semiconductor having electrodes formed to both of an upper and a lower faces;

5 a heat radiating plate to which a lower face electrode of the first semiconductor is joined with use of a joining member; and

10 pillared or spherical electrodes which are joined to the upper face electrodes of the first semiconductor and the heat radiating plate respectively.

15 2. A semiconductor package according to Claim 1, further comprising a sealing resin with which the first semiconductor and a face of the heat radiating plate joined to the first semiconductor are covered in a manner to expose a part of leading ends of the pillared or spherical electrodes.

20 3. A semiconductor package according to Claim 1, further comprising a second semiconductor having electrodes formed to both of an upper and a lower faces and of the same kind of the first semiconductor, a lower face electrode of the second semiconductor being joined to the heat radiating plate with use of a joining member, the heat radiating plate having an electric circuit of an equal polarity formed of a single or a combination material of gold, silver, copper, 25 nickel, and tungsten and set to ceramic, with the first and

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second semiconductors being joined to the electric circuit of the equal polarity.

4. A semiconductor package according to Claim 1, further comprising a third semiconductor having electrodes

5 <sup>2nd</sup> formed to both of an upper and a lower faces and of a <sup>112</sup> different kind of the first semiconductor, a lower face electrode of the third semiconductor being joined to the heat radiating plate with use of a joining member, the heat radiating plate having an electric circuit of a plurality of  
10 polarities independently with the circuit being formed of a single or a combination material of gold, silver, copper, nickel, and tungsten and set to ceramic and with the first and third semiconductors of the different kinds being joined respectively to the plurality of polarities of the electric  
15 circuit.

5. A semiconductor package according to Claim 1, wherein the heat radiating plate is constituted of ceramic in a multilayer structure, having a circuit for the semiconductor and the pillared or spherical electrodes with  
20 the circuit being formed of a single or a combination material of gold, silver, copper, nickel, and tungsten and set to a front face thereof, and the heat radiating plate has conductor layers formed of an equal material to a material of the electrodes of the front face thereof and  
25 arranged between layers of the ceramic to be connected to

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the circuit of the front face, so that heat of the semiconductor is radiated by both the ceramic and the conductor layers.

5       6. A semiconductor package according to Claim 1, wherein the heat radiating plate is formed of any one material of copper, copper alloy, aluminum, and aluminum alloy, or any one of the metals subjected to surface treatment.

10       7. A semiconductor package according to Claim 1, wherein a sealing resin and the pillared or spherical electrodes are formed by removing simultaneously part of the sealing resin and part of the pillared or spherical electrodes after the pillared or spherical electrodes are covered with the sealing resin, thereby exposing the  
15 pillared or spherical electrodes to constitute electric connecting parts.

8. A semiconductor package according to Claim 1, wherein the pillared or spherical electrodes have leading ends pressed smoothly to a uniform height.

20       9. A semiconductor package according to Claim 1, wherein the pillared or spherical electrode is formed of materials of different hardnesses between an inside thereof and an outside thereof.

25       10. A semiconductor package according to Claim 1, wherein the pillared or spherical electrode is formed of

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materials of different melting temperatures between an inside thereof and an outside thereof.

11. A semiconductor package according to Claim 1, wherein further comprising a fourth semiconductor having electrodes formed to both of an upper and a lower faces and of a different kind of the first semiconductor and having a lower face electrode of an equal current and voltage characteristics to the first semiconductor, the lower face electrode of the fourth semiconductor being joined to the heat radiating plate with use of a joining member, the first and fourth semiconductors are mounted on the heat radiating plate.

12. A semiconductor package according to Claim 1, wherein the heat radiating plate is provided with pits and projections to a front face of a face opposite to a face joined to the semiconductors.

13. A semiconductor package according to Claim 1, wherein a plurality of bumps are disposed between the upper face electrodes of the semiconductor and the pillared or spherical electrodes.

14. A method for forming a semiconductor package, comprising:

joining a lower face electrode of a first semiconductor which has electrodes formed to both of an upper and a lower faces to a heat radiating plate with use

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of a joining member; and

joining pillared or spherical electrodes to the upper face electrodes of the first semiconductor and the heat radiating plate respectively.

5 15. A method for forming a semiconductor package according to Claim 14, further comprising, after the pillared or spherical electrodes are respectively joined to the upper face electrodes of the first semiconductor and the heat radiating plate, covering the first semiconductor and a  
10 face of the heat radiating plate joined to the first semiconductor with a sealing resin in a manner to expose a part of leading ends of the pillared or spherical electrodes.

16. A method for forming a semiconductor package according to Claim 14, wherein when the first semiconductor  
15 is joined to the heat radiating plate, a lower face electrode of a second semiconductor of the same kind of the first semiconductor which has electrodes formed to both of an upper and a lower faces is joined to the heat radiating plate with use of a joining member and the first and second  
20 semiconductors are joined to an electric circuit of an equal polarity of the heat radiating plate with the electric circuit of the equal polarity being formed of a single or a combination material of gold, silver, copper, nickel, and tungsten and set to ceramic.

25 17. A method for forming a semiconductor package

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according to Claim 14, wherein when the first semiconductor is joined to the heat radiating plate, a lower face electrode of a third semiconductor of a different kind of the first semiconductor which has electrodes formed to both of an upper and a lower faces is joined to the heat radiating plate with use of a joining member and the first and third semiconductors are joined to an electric circuit of a plurality of polarities independently of the heat radiating plate with the electric circuit being formed of a single or a combination material of gold, silver, copper, nickel, and tungsten and set to ceramic.

18. A method for forming a semiconductor package according to Claim 14, further comprising, before the semiconductor is joined to the heat radiating plate, forming, on a front face of the heat radiating plate constituted of ceramic in a layer structure, a circuit for the semiconductors and the pillared or spherical electrodes by a single or a combination material of gold, silver, copper, nickel, and tungsten, and arranging conductor layers of an equal material to a material of the electrodes of the front face between layers of the ceramic to be connected to the circuits of the front face thereof, so that heat of the semiconductors is radiated by both the ceramic and the conductor layers.

19. A method for forming a semiconductor package

according to Claim 14, wherein, before the semiconductor is joined to the heat radiating plate, forming the heat radiating plate by any one material of copper, copper alloy, aluminum, and aluminum alloy, or any one of the metals subjected to surface treatment.

20. A method for forming a semiconductor package according to Claim 14, further comprising:

after the pillared or spherical electrodes are respectively joined to the upper face electrodes of the first semiconductor and the heat radiating plate, covering the pillared or spherical electrodes with the sealing resin; and

thereafter removing part of the sealing resin and part of the pillared or spherical electrodes simultaneously, thereby exposing the pillared or spherical electrodes to constitute electric connecting parts.

21. A method for forming a semiconductor package according to Claim 14, further comprising, after the pillared or spherical electrodes are respectively joined to the upper face electrodes of the first semiconductor and the heat radiating plate, pressing smoothly leading ends of the pillared or spherical electrodes to a uniform height.

22. A method for forming a semiconductor package according to Claim 14, wherein when the pillared or spherical electrodes are respectively joined to the upper

face electrodes of the first semiconductor and the heat radiating plate, the pillared or spherical electrode formed of materials of different hardnesses between an inside thereof and an outside thereof is used.

5        23. A method for forming a semiconductor package according to Claim 14, wherein when the pillared or spherical electrodes are respectively joined to the upper face electrodes of the first semiconductor and the heat radiating plate, the pillared or spherical electrode formed of materials of different melting temperatures between an inside thereof and an outside thereof is used.

10        24. A method for forming a semiconductor package according to Claim 14, wherein when the first semiconductor is joined to the heat radiating plate, a lower face electrode of a fourth semiconductor having electrodes formed to both of an upper and a lower faces and of a different kind of the first semiconductor and having the lower face electrode of an equal current and voltage characteristics to the first semiconductor, is joined to the heat radiating plate with use of a joining member, so that the first and fourth semiconductors are mounted on the heat radiating plate.

15        25. A method for forming a semiconductor package according to Claim 14, further comprising providing the heat radiating plate with pits and projections at a front face of

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a face opposite to the face joined to the semiconductors.

26. A method for forming a semiconductor package according to Claim 14, further comprising forming a plurality of bumps to the upper electrodes of the  
5 semiconductors,

wherein when the pillared or spherical electrodes are joined to the upper face electrodes of the semiconductor, the pillared or spherical electrodes are joined to the upper face electrodes of the semiconductor via the plurality of  
10 bumps.

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